



# COG11.1 – New Features, Data, V&V

**Rich Buck, Dave Heinrichs, Chuck Lee, Ed Lent**

Lawrence Livermore National Laboratory, 7000 East Avenue, L-198, Livermore, CA, 94550, USA

This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.



## New Features

**CritDetVR** – Enables hybrid criticality/shielding calculations for variance reduction of detector scores with no bias in the keff calculation.

**DFG** – Simulates delayed gamma emission from the fission product decay.

**NRF** – Simulates nuclear resonance fluorescence reactions for nuclear photon absorption and emission.

**RadSrc** – Automatic photon source calculation for gamma emission from  $\alpha$ -decay at a user-specified time (age).

**COGLEX** – Update includes dictionary entries for compounds with thermal scattering law.

## New Data Libraries

NRF Library (Dr. Jim Hall, LLNL):

**COGNRF**

RadSrc Library (Dr. Ed Lent, LLNL):

**COGRS**

DFG Libraries (Dr. Ed Lent, LLNL):

**DFG.ENDFB7R1**

**DFG.JEFF3.1.1**

**DFG.JENDL4**

Neutron Libraries:

**ENDFB7R1**, **PT.ENDFB7R1**, **T.ENDFB7R1**

**JEFF3.1.2**, **PT.JEFF3.1.2**, **T.JEFF3.1.2**

**JENDL4**

Dosimetry Library:

**IRDFF1.02**

Supported Library Formats:

**ENDL**, **ENDF**, **ACE**

**GND** (in progress)

Many, many older data libraries continue to be supported (e.g., JEF2.2, ENDF/B-V).

## MC-to- $S_N$

**ARDRA** – COG geometry package is included in LLNL's modern massively parallel  $S_N$  code with automatic meshing features.

## V&V

**COG11BETA2** has been extensively tested using the following test suites:

**Regression** tests (11 cases)

**ICSBEP** criticality benchmarks (501 cases)

**NRF** tests (3 cases)

**SINBAD** shielding benchmarks (9 cases)

**SILENE** Activation benchmarks (11 cases)

**PHOTONUCLEAR** benchmarks (16)

**KOBAYASHI** exact solutions (in progress)

**CRITCYL** exact solutions (in progress)

## Automation

LLNL is automating V&V code/data testing as described by M.-A. Descalle at ND2013. BNL is involved in a similar effort.

## Website/Email

Please visit our website at <http://cog.llnl.gov> and contact us at [COG@llnl.gov](mailto:COG@llnl.gov).

**LAWRENCE LIVERMORE NATIONAL LABORATORY**  
Science in the National Interest

**COG: A High Fidelity Multi-Particle Transport Code**  
Site Map

**Code (RSICC)**

**Code (OECD)**

**Manual**

**Publications**

**Research: COG Model of the Advanced Test Reactor via FormZ**

**Verification & Validation**

**POINT2012 Data**

**Contact**  
[COG@llnl.gov](mailto:COG@llnl.gov)

**Users**  
Please register!

**User Training**

UCRL-MI-123157 | Privacy & Legal Notice  
September 27, 2013  
Webmaster: Chuck Lee

Lawrence Livermore National Laboratory  
7000 East Avenue, Livermore, CA 94550

Operated by Lawrence Livermore National Security, LLC, for the  
Department of Energy's National Nuclear Security Administration